Mission

Our nation’s ability to remain competitive in the global economy depends on its capacity to develop new knowledge, train scientists, and provide resources that fuel discovery and innovation. Funding for the National Science Foundation’s (NSF) scientific research and education programs is essential to the fulfillment of these goals.

NSF’s mission is “to promote the progress of science; to advance the national health, prosperity, and welfare; [and] to secure the national defense.”\(^1\) Although NSF receives less than 5% of the federal research and development (R&D) budget, it has a leading role in advancing U.S. science, technology, engineering and mathematics (STEM). In addition to providing necessary support for large scale research facilities, NSF funds approximately 20% of all federally-sponsored basic research\(^2\) and at least two-thirds of all federally-sponsored non-medical basic research at America’s colleges and universities.\(^3\) Each year, this funding results in grants to more than 200,000 scientists, teachers and student researchers for cutting-edge projects at thousands of institutions across the country. NSF is also a major force in science education and training. The agency supports education research and funds initiatives to prepare teachers, develop curricula, and engage students in scientific activities that are critical for strengthening our scientific workforce. NSF’s support of science and education and its emphasis on integrating research and education make it unique among federal research sponsors; its broad approach stimulates the flow of ideas across scientific boundaries and brings new insight to bear on perplexing research questions. NSF’s pioneering research investments have advanced the frontier of science and have led to the development of marketable technologies, processes and methods.

A recent National Academies report warns that as other countries make R&D spending a top priority, the scientific and technological building blocks that are critical to U.S. economic leadership are eroding.\(^4\) Expressing a similar sentiment, the U.S. Office of Science and Technology Policy stated that “keeping our competitive edge in the world economy requires policies that lay the ground work for continued leadership in innovation, exploration, and ingenuity.”\(^5\) Although Congress recognized NSF’s contribution to the science and technology enterprise when it authorized a doubling of the agency’s budget by 2007, NSF’s budget remains far below the amount the NSF Authorization Act of 2002 specified.\(^6\)

---


\(^2\) Ibid.


Enactment of the *America Creating Opportunities to Meaningfully Promote Excellence in Technology, Science, and Education (COMPETES) Act*\(^7\) in 2007 renews U.S. commitment to science and technology and puts NSF on a path to double its budget by 2015, permitting the agency to expand its support for scientific research and education and training programs. These critical investments in NSF will ensure that the U.S. remains at the forefront of scientific discovery and technological innovation.

**Select Accomplishments in Research and Education**
Research that NSF funds traverses the sciences, captures the imagination, and improves our quality of life. A few highlights of innovative research and education projects NSF supports follow.

**Nanotechnology**
Nanotechnology is a multidisciplinary field in which scientists design and build objects and even machines with the dimensions of individual atoms and molecules. This new research area is revolutionizing everything from computers to health care, and NSF is leading the charge.

- **Developing Medical Nanosensors:** Scientists have developed nanosize chemical sensors that can detect glucose in human tissue. This research is paving the way for the development of a class of biosensors that could improve the way diabetics monitor blood sugar and facilitate tracking a variety of other molecules, such as hormones, cholesterol and drugs.

- **Disrupting Cancer Development:** Scientists have found they can use antisense DNA to disrupt cells’ production of cancer-causing proteins; attaching gold nanoparticles to antisense strands enhances their ability to disrupt the production of these proteins.

**High-End Computing and Advanced Networking**
Computational research that NSF funds is driving discovery in critical scientific fields. High-end computing and advanced networking is enabling scientists to better understand biological systems and apply new knowledge to pressing health, environmental and social concerns.

- **Developing HIV Drugs:** Scientists are harnessing the power of super-computers to model molecular structure and movement. Structural models of enzymes that permit HIV to survive and proliferate have guided the development of new drugs to target these essential proteins.

- **Networking Biodiversity Data:** The Global Biodiversity Information Facility has created a worldwide network of biodiversity data, including genetic and ecological data, on the earth’s myriad species. This information is useful in predicting the spread of disease, identifying the sources of disease-resistant crop genes, and tracking the spread of invasive species.

**Materials Science and Engineering**
Nature produces an array of materials with structural properties that the materials scientists create in labs cannot rival. Basic research on the structures of these materials is helping engineers develop new products with medical and industrial applications.

---

\(^7\) H.R. 2272. (August 2007) *America Creating Opportunities to Meaningfully Promote Excellence in Technology, Science, and Education (COMPETES).*
• Developing Artificial Joints and Limbs: Basic research on the biology of the unique cartilaginous skeletons of sharks may help researchers design biological materials that are suitable for the development of artificial joints and limbs.

• Medical Uses of Collagen: Researchers have discovered ways to modify collagens that may help block the formation of scar tissue, control the growth of blood vessels in tissues for implantation, and develop better infection-fighting bandages.

Basic Physiological Processes
Though it may not be evident at first glance, humans have a fair amount in common with species as diverse as fungi, frogs and bears. Due to similarities at the genetic, cellular and physiological levels, studying these and other organisms yields insight into human health and disease. NSF support for this basic scientific research paves the way for human medical advances.

• Advancing Organ Transplant Technology: Researchers discovered that certain frogs produce an “antifreeze” that prevents cell damage in frigid temperatures. As a result, these frogs can survive for months in freezing weather even though their major organs have come to a practical halt. Research in this area may lead to technologies that permit longer preservation of human organs and, therefore, improve transplantation success rates.

• Using Baker’s Yeast to Study HIV: Yeast cells are structurally similar to human cells and contain harmless retrovirus-like elements that scientists use to model HIV. A mechanism scientists discovered in these retrovirus-like elements may be the missing link to retrovirus replication and may provide a new target for the development of HIV drugs.

Science Education and Training
The National Science Foundation supports the nation’s STEM infrastructure by contributing to science education. NSF programs are cultivating the next generation of scientists and engineers by developing research curricula, engaging K-12 and undergraduate students in science, providing support for graduate and postdoctoral researchers, and improving teacher training.

• Math and Science Partnership (MSP) Program: This program supports educational partnerships between universities, local school systems, businesses, and informal science organizations. Early analyses of this initiative demonstrate that participating students show improvements in math and science proficiency.

• Science, Technology, Engineering, and Mathematics Talent Expansion (STEP) Program: The STEP program aims to increase the number of students who obtain undergraduate degrees in STEM disciplines through grant support to academic institutions. With STEP funding, colleges and universities have developed programs to engage women and minorities in science, provide students with research opportunities, and introduce them to scientific careers.

• Integrated Graduate Education Research and Training (IGERT) Program: This initiative supports 125 doctoral degree programs that foster interdisciplinary training in emerging scientific domains. IGERT trainees have produced important scientific and technological
breakthroughs, which include a handheld imaging device that can detect breast tumors and “bio-transformable” materials doctors can implant in the body to deliver drugs or open blood vessels.

**Investing in the Future**
NSF’s strategic plan for the future\(^8\) outlines the agency’s approach to building our nation’s research capacity. By combining support for basic research, education, and training with investments in emerging areas of scientific interest and need, NSF will ensure that the U.S. has the infrastructure and talent to maintain its role as a leader in science and technology.

**Fundamental and Transformational Research**
NSF will continue to support both transformational R&D and the basic science on which it depends. The agency is emphasizing interdisciplinary investigation in areas such as the neural bases of behavior, energy and climate research, and nanomaterial safety. Through investments in computer science and mathematics, NSF will advance research in all STEM disciplines and enhance our ability to make future discoveries.

**Systems Biology**
Support for NSF is critical to advancing new areas of biological discovery such as systems biology. NSF has led this emerging field, which unites biologists, chemists, engineers, mathematicians and physicists. Systems biologists are developing a better understanding of living systems and their interactions with the non-living world, which is essential to understanding the global impact of phenomena such as climate change.

**Education and Training**
By funding initiatives such as MSP, STEP and IGERT, NSF will continue to foster innovative approaches to science education. NSF’s focus on integrating research and education; bridging gaps between K-12, undergraduate science and technical education; and expanding partnerships between academia and industry will broaden interest and participation in science careers.

**Recommendation**
If we are to continue to lead the world in innovation and prepare for future prosperity, funding for NSF is essential. As NSF Director Arden Bement, Jr. has said, “America’s sustained economic prosperity is based on technological innovation made possible, in large part, by fundamental science and engineering research. Innovation and technology are the engines of the American economy, and advances in science and engineering provide the fuel.”\(^9\) Without a greater commitment to NSF, our country faces the grave possibility of losing its global dominance in science and technology.

In keeping with the America COMPETES Act of 2007, FASEB recommends an appropriation of $7.33 billion for the National Science Foundation in FY2009.

---
